DOCUMENT RESUME

ED 050 722 JC 710 158

AUTHOR Maxwell, L. M.; And Others
TITLE University-Two Year College Cooperation Through Direct Communication Linkages.
INSTITUTION Colorado State Univ., Ft. Collins.
PUB DATE [70]
NOTE 16p.; Paper presented at the National Science Foundation, Division of Undergraduate Education in Science, Combined UES Project Directors Meeting, February 12, 1970, Washington, D. C.

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS *Autoinstructional Programs, *Automation, College Credits, Computer Science, *Engineering, Experimental Programs, *Junior Colleges, Mathematics, *Transfer Policy, Transfer Programs, Vocational Education
IDENTIFIERS *Colorado

ABSTRACT

Colorado State University launched an experimental program, CO-TIE (Cooperation via Televised Instruction in Education), with one other 4-year college and five 2-year colleges in the state. The program was designed to ease the transition of junior college transfer students in engineering and other professional disciplines to a 4-year college. It was hoped to alleviate the lack of realistic agreements on common core curricula and transfer credit arrangements between 2- and 4-year colleges. The program employs modern automated educational techniques such as videotapes, electronic blackboard-by-wire, and other low-data-rate transmission devices for courses in mathematics, computer science, and vocational education. The mechanics of the instructional process is discussed. (Author/CA)

ED050722

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

University - Two Year College Cooperation Through Direct Communication Linkages

L. M. Maxwell
Professor
Electrical Engineering
Colorado State University
Fort Collins, Colorado 80521

R. J. Churchill
Professor and Head
Electrical Engineering
Colorado State University
Fort Collins, Colorado 80521

W. Lord
Associate Professor
Electrical Engineering
Colorado State University
Fort Collins, Colorado 80521

JC 710 158

Presented at the National Science Foundation
Division of Undergraduate Education in Science
Combined UES Project Directors Meeting

February 12, 1970
Washington, D. C.

UNIVERSITY OF CALIF.
LOS ANGELES

JUL 15 1971

CLEARINGHOUSE FOR
JUNIOR COLLEGE
INFORMATION

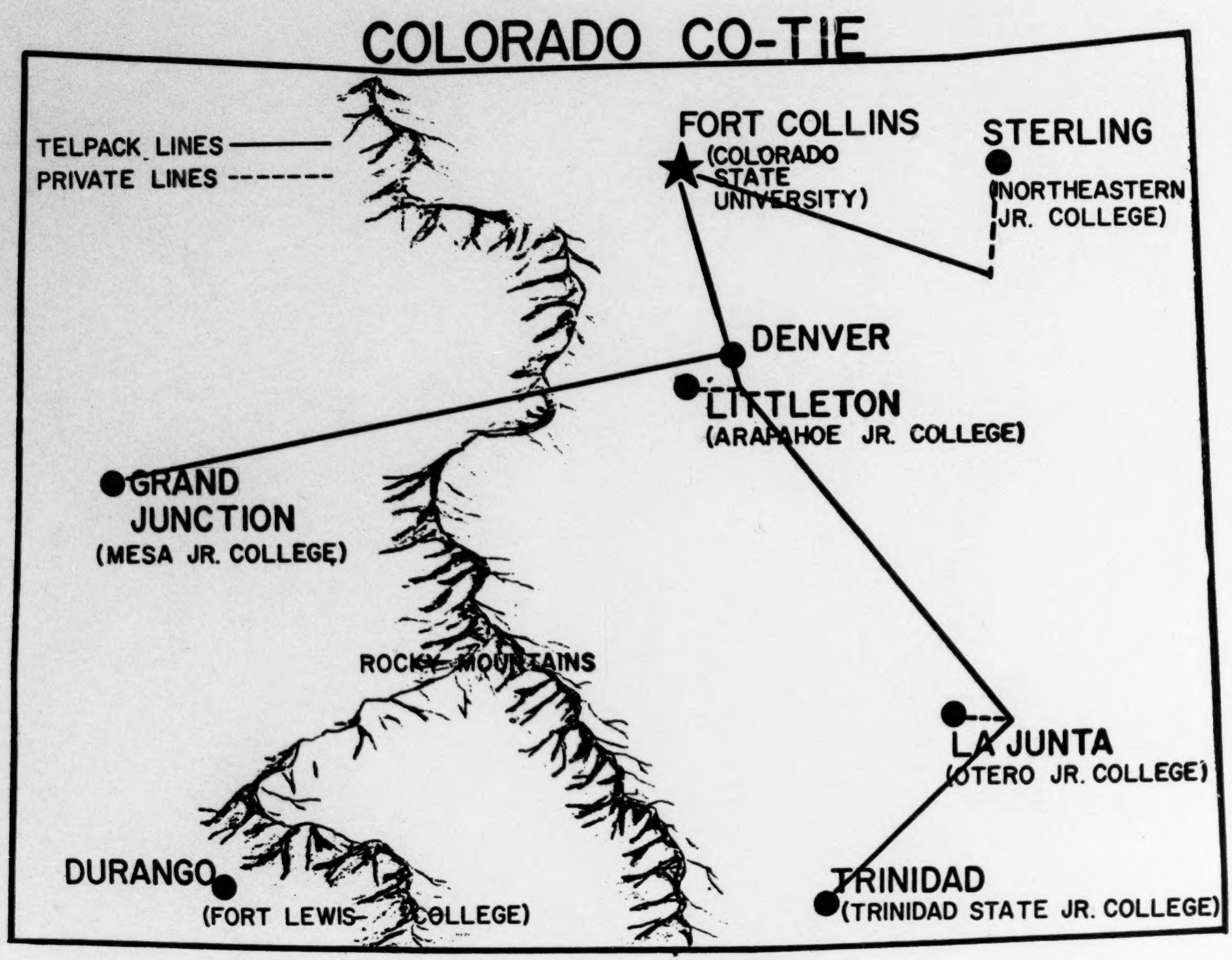
ABSTRACT

Wide ranging equality of educational opportunities for students in various types of state colleges and universities has not been achieved primarily because of the shortage of faculty and facilities in the colleges and the lack of realistic agreements on common core curricula and transfer credit arrangements. In response to this need to provide greater educational opportunities, the faculty at Colorado State University launched an imaginative experimental program with the cooperation of six other Colorado institutions of higher education. Titled Project CO-TIE*, the program employs modern automated educational techniques such as the use of video tapes, electronic blackboard-by-wire and other low data rate transmission devices in a network reaching out to the four corners of the state--some 400 miles from CSU.

Project CO-TIE is designed to ease the transition of non-terminal college students as they transfer to four-year university programs particularly in engineering and other professional disciplines such as veterinary medicine, forestry, business and home economics. The 1968-69 program offered a three-course sequence in electric networks and a single course in fluid mechanics to the six colleges whose pre-engineering curricula were lacking in these key prerequisite courses upon which so much of the junior and senior year university curriculum depends. Mechanics of the instructional process included three video taped lectures per week, two sixty-minute tutorial sessions per week on an electronic blackboard-by-wire system, several visits per quarter by the CSU faculty member in the course and one supervisory instructor at each location drawn from the engineering or science staff to oversee the program by collecting homework, proctoring examinations, assisting with tutorials and assigning grades to the participating students. During the past year approximately 50 engineering students were served by the CO-TIE program and well over 100 other personnel such as college instructors and vocational students were served by courses in mathematics, computer science and vocational education provided through the CO-TIE facilities.

* An acronym for: Cooperation via Televised Instruction in Education

Project CO-TIE was initiated in 1968 with partial support from NSF Grant GY 5305.



CO-TIE TELEPHONE NETWORK

I. INTRODUCTION

Equality in educational opportunities for college students has not been achieved at the state level primarily because of the shortage of qualified faculty in the junior colleges and the absence of realistic agreements on common core curricula and transfer credit arrangements among the universities and junior colleges. Students who attend the junior college pre-programs in engineering, veterinary medicine, business, home economics and forestry (etc.) will often lose up to one year when transferring to a university because of their inability to start specific course sequences due to lack of prerequisites.

A society with a shortage of trained manpower cannot afford to tolerate this decreased productivity or to impose injustice on those who are not fortunate enough to begin their education at a university. Educators have pondered this problem for decades and solutions have been slow to emerge because of the traditional conservatism of university faculties, perennial inter-institutional suspicion and mutual protection of roles and sanctity of on-campus instruction by academic professors within the hallowed walls of the classroom.

Within this framework, the faculty in Electrical Engineering at Colorado State University launched an imaginative experimental program requiring the cooperation of CSU and six colleges (one four-year college and five junior colleges) within the State of Colorado situated at widely varying geographical locations. The program set out to dispel the traditional fears and to overcome faculty-generated obstacles in the way of genuine inter-institutional cooperation in higher education. Project CO-TIE (Cooperation via Televised Instruction in Education) tested first the will of university faculty to seek solutions to problems in education

and secondly the desire of junior college faculty and students to be helpful with one of their major transitional problems. The reluctance of the faculty to teach off-campus, non-credit-hour producing students and the sensitivity of junior college instructors to intrusion into their teaching domain very soon gave way to an all out effort to provide the best educational experience and subsequent transition for the students participating in the program. Thus was born Project CO-TIE--a potential solution to the numerous problems including the equality of educational opportunity, inter-institutional confidence and cooperation, development of common core curricula and transfer credit arrangements, dialogue among university and college faculties, and increased educational opportunities for junior college faculty. Comments on these and on future horizons for the CO-TIE concept are offered in the following sections of this paper.

II. SATISFIABLE NEEDS

In addition to the need for increased personnel and facilities, the greatest aspirations of a junior college president are to provide a unique educational experience for his students while at the college and subsequent smooth transition into the university system for non-terminal students, to generate a continual increase in the level of competence of his faculty who have chosen to develop their career in junior college teaching, and to create a professional dialogue among all junior colleges and maintain continual communication between the colleges and the universities within the region of geographical interest.

In like manner, in addition to the pursuit of excellence in teaching and research, the university--and particularly the state university--must look to the service that it alone can provide to the society from

which its financial base of support is derived; facilities and faculty sharing being one of the best ways in which to generate economies and broaden the base of university contributions.

a) Needs of the Two-Year College Student

Students enroll in two-year colleges because of a number of financial and social influences varying all the way from cheaper tuition to the desire to be near one's parental home. Very seldom does the student consider the quality of education in comparison with other institutions and infrequently does he see his course program beyond the freshman year. When a student turns his attention towards one of the professional programs, such as engineering, business, home economics, etc., he discovers the shortage or the absence of certain key courses and becomes aware of transfer credit requirements for various universities and finally, that the lack of key courses will probably cost him a full year in his career development. He soon realizes that the small pre-professional enrollments do not permit the offering of the key courses or that suitably trained faculty are unobtainable. At this point the student often undergoes severe emotional strain because of the transfer versus economy syndrome: Should he transfer in his sophomore year, thus missing his Associate degree and accepting greater financial burden in addition to social displacement or should he remain at the college and change to some other discipline?

These are the problems that Project CO-TIE solves for the student in engineering in six Colorado colleges. The key courses not generally available are in the area of Electric Networks and Fluid Mechanics and they are made available to the students under the CO-TIE concept which provides three video-taped lectures and two tutorial sessions via blackboard-by-wire every week.

b) Needs of the Two-Year College Instructor

Second only to his desire to provide a quality education for his students, the two-year college instructor has to be mindful of progress in his own career. As a college teacher, he needs to maintain teacher certification and those instructors in technological areas must keep pace with new developments so that their curriculum will remain viable. Traditionally, teachers could achieve self-improvement through leaves of absence and by participation in summer programs and summer institutes--even though their opportunities were intermittent because of competition and scarcity of suitable institutes. In any event, this is the era of on-the-job training and college teachers as well as industrial employees look for their new fringe benefits in selection of new positions and in bargaining for improving their present positions. Over and above this, many teachers are interested in obtaining advanced degrees in the same ways as industrial personnel obtain Master's degrees through course work provided in evening or extension programs.

College instructors have found Project CO-TIE to be an excellent solution to their problems because it does provide them much the same service as it does the undergraduate students. In addition to the sophomore courses for pre-professional students, Colorado State University makes available the following types of educational material for use by the college instructors:

a) Video tapes of single lectures and seminars.

b) Video tapes of sets of lectures, such as a series of ten lectures in computer programming.

c) Video tapes of undergraduate senior elective courses.

d) Video tapes of graduate courses in various areas.

Since the necessary video equipment is available at the colleges because of Project CO-TIE the instructor simply utilizes the system as do

the undergraduate students. Many of the instructors register formally as CSU students and receive resident course credit which may be used towards a degree at CSU or elsewhere. The most popular courses for the college instructors are in the areas of mathematics and computer science because of curricula pressures exerted in this direction.

c) Need for Increased University/College Dialogue

The need for increased dialogue among educators is well known to the university and junior college communities and the mechanism for this continual interaction has not generally been established. Again Project CO-TIE has provided a unique solution for seven of Colorado's institutions of higher learning. The CO-TIE program has a telephone network dedicated 24 hours a day and a blackboard-by-wire system which allows two-way audio and one-way graphic communications. As a result of this, the faculty at CSU and the college instructors have developed an excellent rapport and now freely discuss matters of student quality, course content, transfer credit, degree programs for the college instructors, new curricula proposals, faculty sharing and other resource sharing. The two groups are now much better aware of common problems and are much more willing to hold group meetings at various convenient geographical locations to deal in great detail with current issues. Most important is the mutual confidence and respect developed by the CO-TIE participants and the lasting friendships among displaced colleagues which have resulted.

III. THE BIRTH OF CO-TIE

In September, 1967, a program of in-plant graduate education using video-taped lectures was initiated for Colorado industry by Dr. L. V. Baldwin,[1] Dean of the College of Engineering. This program met with

immediate success and Dean Baldwin threw out the challenge to the faculty to broaden our educational horizons using modern educational techniques. In December, 1967, Drs. L. M. Maxwell and R. J. Churchill conceived of Project CO-TIE in principle and the program was subsequently developed by Dr. Maxwell along the following lines:

a) An examination of college course offerings in the pre-engineering program showed that the sophomore electric networks sequence and the fluid mechanics course were missing from most curricula.

b) The cooperation of a number of colleges was enlisted and six responded by attending a planning meeting at CSU on January 30, 1968.

c) A proposal was planned and submitted to NSF in March, 1968, and was subsequently funded under Grant GY 5305 and began July, 1968.

d) Another series of meetings with college faculty and administration resulted in the offering of a three course sequence in electric networks and one course in fluid mechanics during the 1968-69 academic year.

The electric networks sequence was taught by Maxwell, Churchill and Lord three times a week and the video-taped lectures were distributed to the colleges. This part of the program was in fact similar to Dean Baldwin's graduate program for industrial personnel. The addition of the blackboard-by-wire and the dedicated telephone network made possible the tutorial part of the course and encouraged much conversation between CSU faculty and college personnel--particularly the students. Some 50 students enrolled in the program and the first year was considered very successful by the college instructors and students.

From this rather modest beginning, the program is expanding to include new concepts and systems and they are described in subsequent sections of this paper.

The six Colorado colleges participating in Project CO-TIE are: Arapahoe Junior College, Littleton; Northeastern Junior College, Sterling; Otero Junior College, La Junta; Trinidad State Junior College, Trinidad; Mesa Junior College, Grand Junction and Fort Lewis College, Durango.

IV. OPERATION OF PROJECT CO-TIE

a) Academic Aspects

The principal objective of Project CO-TIE is to provide an educational opportunity for students enrolled in junior colleges and other colleges offering pre-professional programs so as to ease their transition to the university system and possibly save them one year in achieving their career objectives. The CO-TIE service is provided with no extra cost to the student and no loss in credit hour production at the college because the students are enrolled in the college course and not at CSU. The students take the same course as do CSU students. They perform the same homework assignments and they write the same examinations as do the CSU students taking the course simultaneously. The examinations are graded partially by CSU faculty and partially by the college instructor, but the grades are assigned by the college instructor in consultation with the CSU faculty. In this way the integrity of the college system is maintained and no effort is made to take over the role of the college instructor.

Tuition is paid by the student to his college and CSU does not require or expect any financial contribution from the colleges other than the provision of suitable classrooms to house the equipment, to which CSU retains title, and the acquisition of technical personnel to keep the equipment operating satisfactorily.

b) The CO-TIE Facilities

In the initial program, considerable care was taken to preserve the natural and conventional classroom atmosphere. All video-tapes were made before a live class of CSU students actively participating in discussion and questions during the lecture period. To some extent this weakens the

video presentation but the students seem to feel that they are a part of a real system of education and not just the recipients of canned programs.

The essential features of the CO-TIE system are outlined below. Pictures on the following page illustrate most of the hardware items.

Studio Classroom: The studio classroom seats 30 students and is equipped with three TV cameras. One camera, located at the rear of the room, focuses on the instructor. This camera is remotely controlled (tilt, pan, zoom and focus) by the TV technician-cameraman from a console at the recording facility. The cameraman tracks the instructor as he is working at the blackboard. Another camera is mounted permanently over the desk. With the overhead camera the instructor illustrates his lectures by writing with felt pens on off-colored pads. The instructor may also choose to use 35 mm slides in a projector focused through an opaque screen mounted in the desk top and directly under the overhead camera. A third camera mounted in the front of the room is aimed at the students. By a switching console on the right side of the desk, the instructor selects whichever camera is to be recorded on the video tape. There are five TV monitors in the studio classroom, three for the instructor (line, overhead and rear) and two for the students in the classroom. At each desk a microphone is located which records on the video tape questions asked by students. The instructor wears a lapel microphone.

Central Recording: The central recording facility, under the direction of the Office of Educational Media, is located two blocks away from the studio classrooms. A system of co-axial and audio cables connects the classroom to the recording facility. Included in this facility are 18 video monitors and recorders. Two studio classrooms are simultaneously

served by the recording facility. Because duplicating video tapes is not an economical operation each video tape is made as an original.

Video Tape Distribution: After the video tapes have been produced they are delivered to the colleges by parcel post or by a courier. The usual mode of operation is to have the tapes played back within two days after they are made. After the tapes have been seen they are returned to the CSU campus then erased and used again for other class sessions. The CO-TIE program does not store libraries of tapes.

Playback Facilities at Colleges: The equipment necessary for the playback facility includes two video recorders and two TV monitors. Reliability is maintained through redundancy of equipment. To maintain satisfactory performance the video recorders require careful handling and operating procedures with a clean-room atmosphere.

Telephone Network and Blackboard-by-Wire: To maintain dialogue between campuses a blackboard-by-wire system is used. This system in conjunction with a dedicated telephone network supports two-way audio between each campus. Graphic (real time writing) information may be transmitted from an electromechanical pen at CSU onto the video monitors at the colleges. Scheduled recitation periods, faculty conferences and "office hours" are conducted via this system. The present telephone network consists of two lines (each 462 miles), one graphic and one audio. The entire network is fully dedicated, available 24 hours per day.

Program Cost: The long-term cost per full-time equivalent student in any educational program is of prime importance to the educational institution and to the individuals or agency supporting the program. Table 1 illustrates approximate capital outlay costs incurred by

Project CO-TIE during its first year of operation.

Table 1

CO-TIE Capital Outlay Costs

1.	Studio classroom equipment (for one classroom, excluding air conditioning)	$ 8,000
2.	Central recording facility equipment (serves two classrooms)	40,000
3.	Central blackboard-by-wire facility equipment	7,000
4.	Playback classroom equipment (per classroom $2,500)	15,000
5.	Remote blackboard-by-wire equipment (per location $4,000)	16,000
6.	Video tape	15,000
	Total Capital Outlay	$101,000

Annual operating costs must include support for items listed in Table 2.

Table 2

Items Charged to Annual Operating Costs

1. Faculty and Staff including Project Coordinator
2. Electronics Technician
3. TV Technician - Cameraman
4. Video Tape Distribution (mail or courier)
5. Video Tape Replacement (approximately 20% per year)
6. Replacement Parts
7. Telephone Network

During its first and second years the CO-TIE project averages approximately $60,000 per year for operating costs. Cost per credit hour produced is admittedly high in the pilot year, however, as the CO-TIE system becomes more efficiently used (as it will) these costs

per credit hour will be reduced very significantly. The off-campus credit hours produced should be more costly than comparable on-campus credit hours.

The present CO-TIE telephone network costs $1,155 per month. A significant savings is realized by using Government Telpak lines which cost $0.50 per mile per month versus $3.00 per mile per month for private lines.

V. SUMMARY OF BENEFITS FROM PROJECT CO-TIE

The first year operation focused on the provision of key courses in the pre-professional programs and more particularly engineering. At least ten students have already found it easier to transfer to CSU and other universities to complete their degree programs in engineering. Many others have received courses they would ordinarily miss in the absence of Project CO-TIE. All of the CO-TIE students have certainly become more aware of university curricula and teaching techniques and consequently their personal experiences have been broadened.

The college instructors improved their own backgrounds in the course areas by acting as recitation instructors for the sophomore courses and conversing frequently with the CSU faculty offering the courses. The college faculty also benefited significantly from the upper division and graduate courses made available on Project CO-TIE and at least one faculty has advanced further towards his Master's degree.

The CO-TIE network was also used experimentally in offering several short courses such as computer programming, Professional Engineering Exam review sessions and lectures in vocational education. Other course areas will be added as the program expands.

The preparation of lectures to be video-taped always leads to considerable introspection on the part of the teacher and much undue criticism

on the part of the students and faculty colleagues who have reason to observe the video-taped lectures. During the first year of the program, a controlled evaluation was performed by the CSU Human Factors Research Laboratory so that many subtle features will be elucidated and professor evaluation will not remain the focal issue. Wide variations have already been seen between students on the CSU campus and those at the participating colleges and a number of student suggestions have been incorporated to improve the total program in subsequent years.

VI. THE FUTURE

The overall objective of the program in future development is to improve the educational experience for the student. New technological developments such as slow scan television will be employed in order to achieve a better tutorial situation in the informal recitation sessions.

One highly important feature is the effort to increase the role of the digital computer in the educational process and consequently provision is now being made to add a remote terminal of the CSU CDC 6400 digital computer at each of the participating colleges. This will enrich the student participating in the formal course and provide a unique opportunity for the college instructor to conduct research projects using digital computation and simulation.

There very definitely exists the need to increase the number of students on the CO-TIE program in order to effect greater economies and a more realistic cost per educational unit. Potential increase in users of the system is to be found in vocational education, mathematics, home economics, forestry and data processing.

New concepts in Computer Assisted and Managed Instruction are being studied at CSU and undoubtedly some of these will find ready application in the CO-TIE program.

Throughout the future development of Project CO-TIE the participants will not lost sight of the principal objective of providing greater educational opportunity for students and maintaining inter-institutional support and mutual confidence in the institutions of higher education. CO-TIE by its very nature strives to bind together those institutions having education, our greatest natural resource, as their common goal.

Acknowledgements

A program as large and as complex as Project CO-TIE is necessarily the work of many more individuals than the authors of this paper. In particular we wish to thank the following CSU personnel: Executive Vice President A. R. Chamberlain, Dean L. V. Baldwin, Dr. J. H. Belknap and Mr. Preston Davis. We wish also to thank the personnel of the participating colleges, the National Science Foundation for support under Grant GY 5305, Ampex Coporation and the 3-M Company.

Reference: [1] In-Plant Graduate Courses on Videotape: Project Colorado SURGE, L. V. Baldwin, Jounral of Engineering Education, ASEE, May 1969.